

# Prudential regulation and the cost of bank funding

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**1.- The regulatory agenda and key market trends****New prudential requirements: the goals****Regulatory changes****Key market trends****2.- Regulatory risk vs. actual risk****Theory****Some evidence****3.- Effects on risk taking****Theory****Some evidence: banks' betas****4.- Effects on the cost of funding****Cost of equity****Cost of debt**

New prudential requirements follow the Basel II philosophy: **increase requirements with two goals:**

- **deal with potential losses**
- **ensure less risk is taken (more skin in the game)**

The final goal of the regulation is:

- to diminish the probability of crisis
- at a reasonable cost

**Whether these goals are achieved or not will depend on the answer to two key questions:**

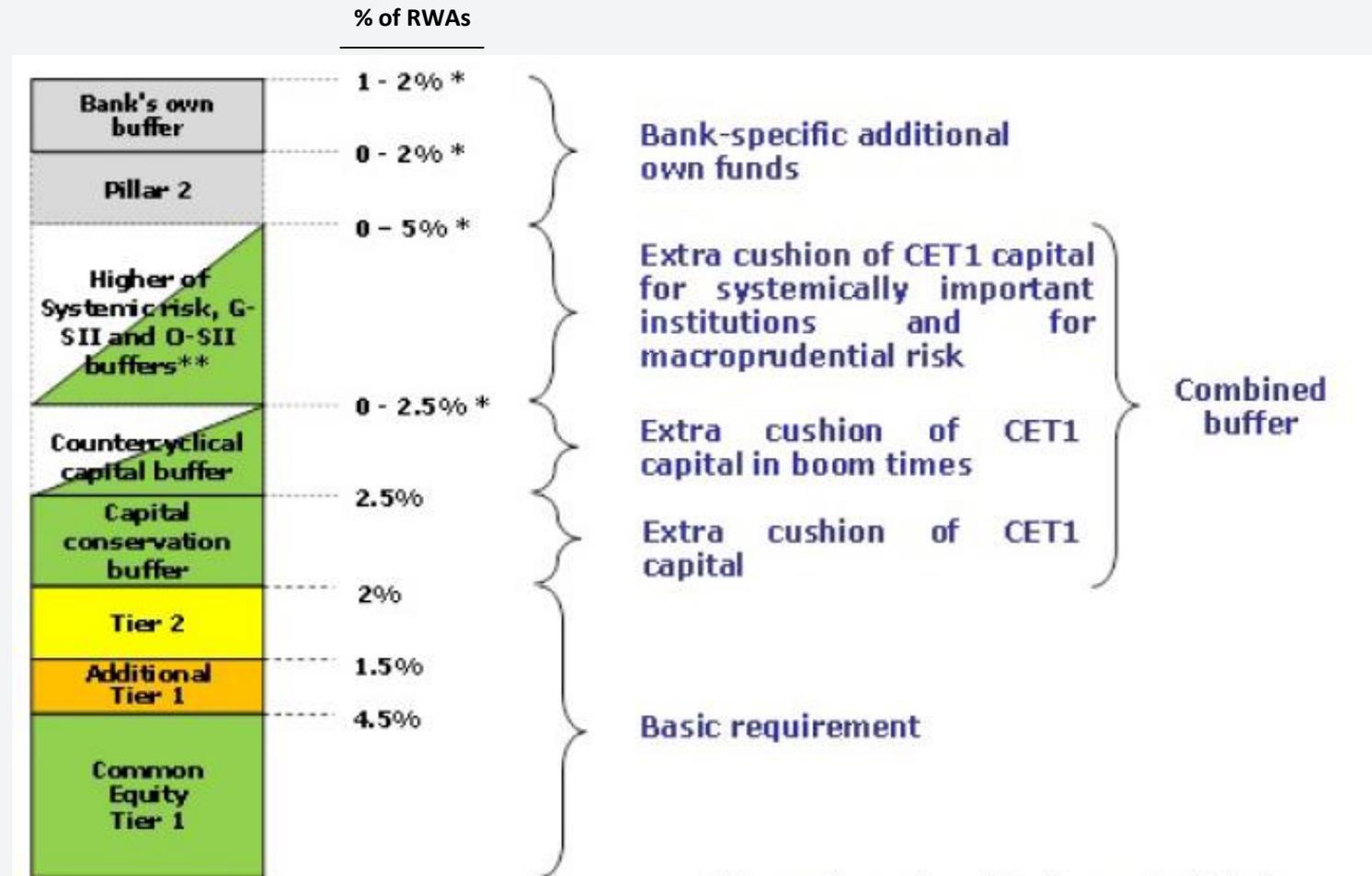
**1) Will higher prudential requirements imply less actual risk taking?**

**If that is not the case, the Basel approach will not work**

**If it is, then the question is:**

**2) Will higher prudential requirements increase the cost of bank funding?**

## New capital requirements under the Capital Requirements Directive (CRD IV)

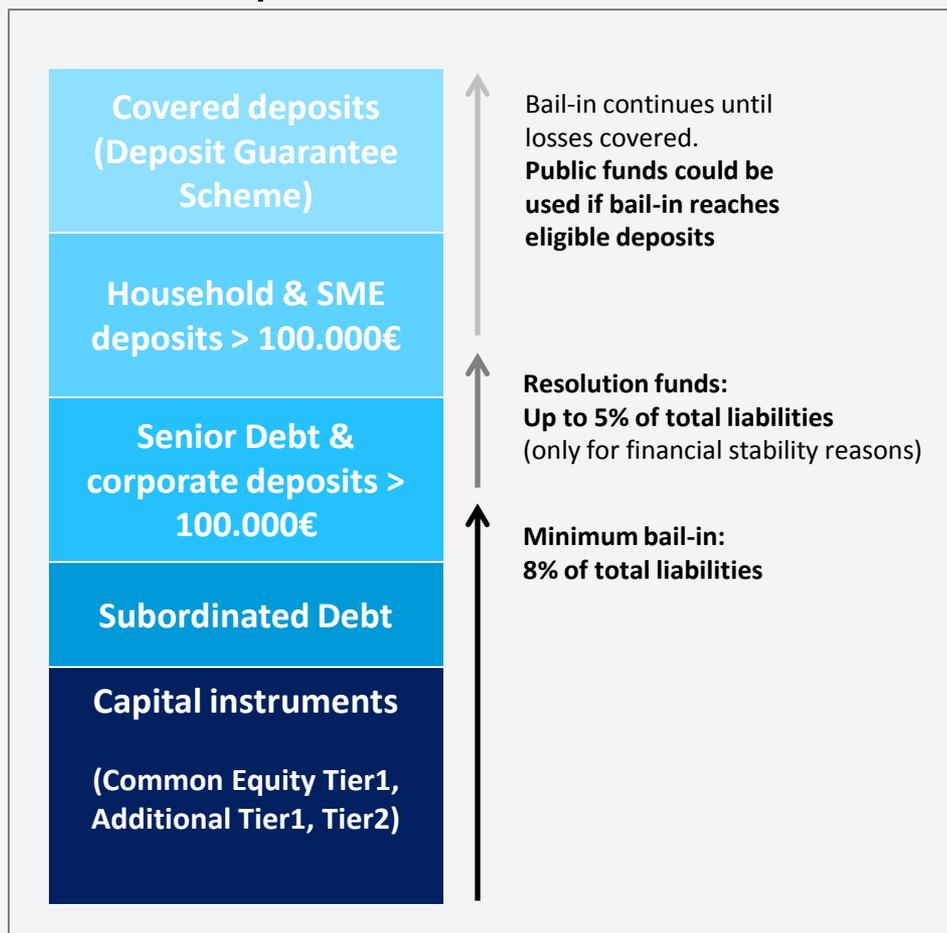


\* Assumed upper bounds (values can be higher)

\*\* In certain cases can be the sum of SII and systemic risk buffer.

## Other regulations with potential impact on capital

## EU Bail-in requirements



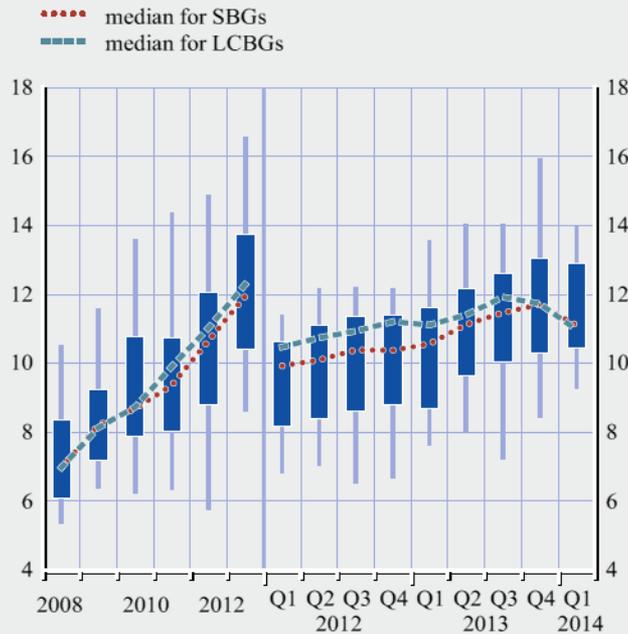
## Other regulations:

- **Leverage ratio:**
  - CET 1 capital / non-weighted exposures (on- and off-balance sheet)
  - Only reporting requirements
  - Binding level to be decided
- **Minimum level of bail-inable liabilities**
  - In progress
  - Possibly institution specific
- **GLAC for G-SIFs**
  - In progress
  - Need to decide on: class of instruments, level and location of the GLAC within the group structure

## Sharp increase in regulatory capital ratios

**Chart 3.6 Core Tier I capital ratios of euro area banks**

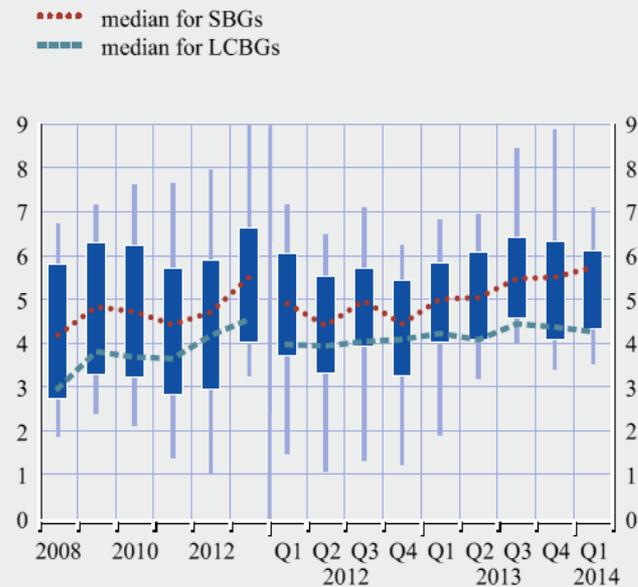
(2008 – Q1 2014; percentages; 10th and 90th percentiles and interquartile range distribution across SBGs)



Source: SNL Financial.  
 Note: Based on publicly available data on SBGs, including LCBGs, that report annual financial statements and on data on a sub-set of those banks that report on a quarterly basis.

**Chart 3.9 Euro area banks' leverage ratios (tangible equity to tangible assets)**

(2008 – Q1 2014; percentages; 10th and 90th percentiles and interquartile range distribution across SBGs)

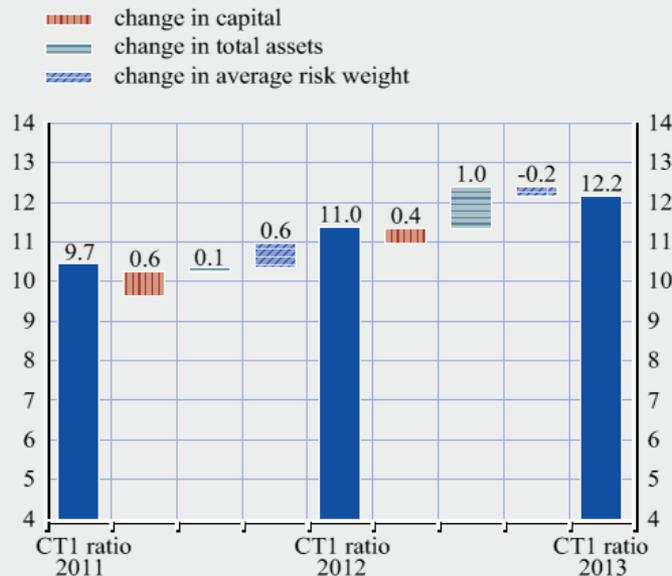


Source: SNL Financial.  
 Note: Based on publicly available data on SBGs, including LCBGs, that report annual financial statements and on data on a sub-set of those banks that report on a quarterly basis.

## De-risking? Deleveraging?

**Chart 3.8 Decomposition of changes in euro area banks' aggregate core Tier 1 ratio**

(2011 – 2013; percentages and percentage points)

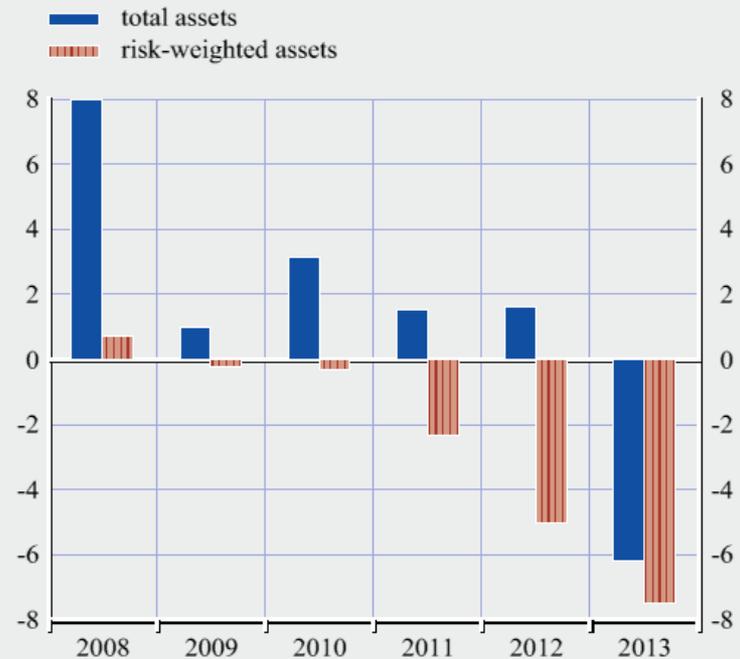


Source: SNL Financial.

Notes: The aggregate core Tier 1 ratio is based on publicly available data for a sample of 69 SBGs. The positive contributions of changes in total assets and average risk weight represent deleveraging and de-risking respectively.

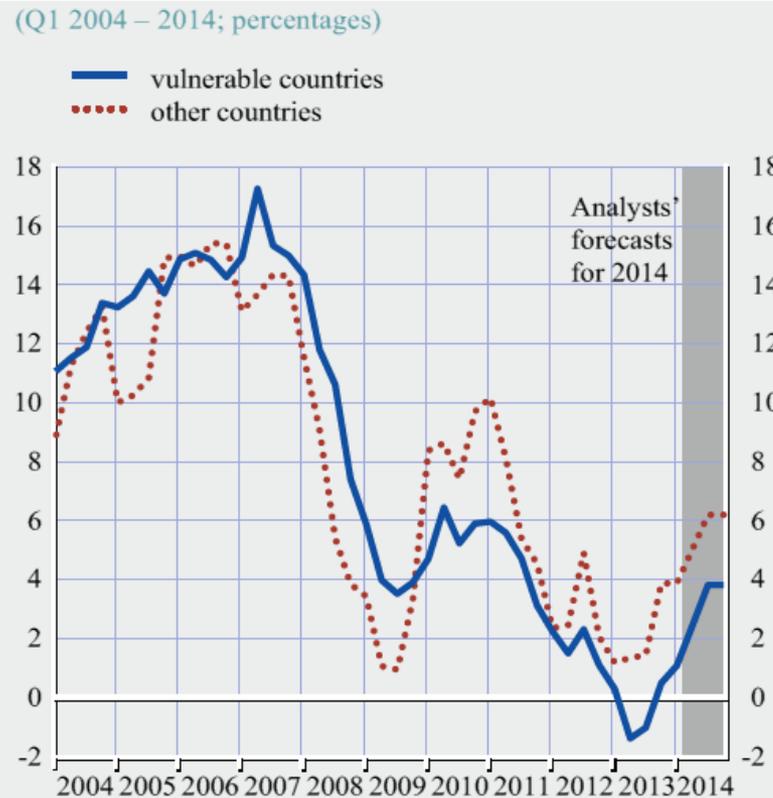
**Chart B Changes in euro area banks' total assets and risk-weighted assets**

(2008 – 2013; percentage change per annum; averages for significant banking groups)



Sources: SNL Financial and ECB calculations.

## Return on equity of Euro Area significant banking groups

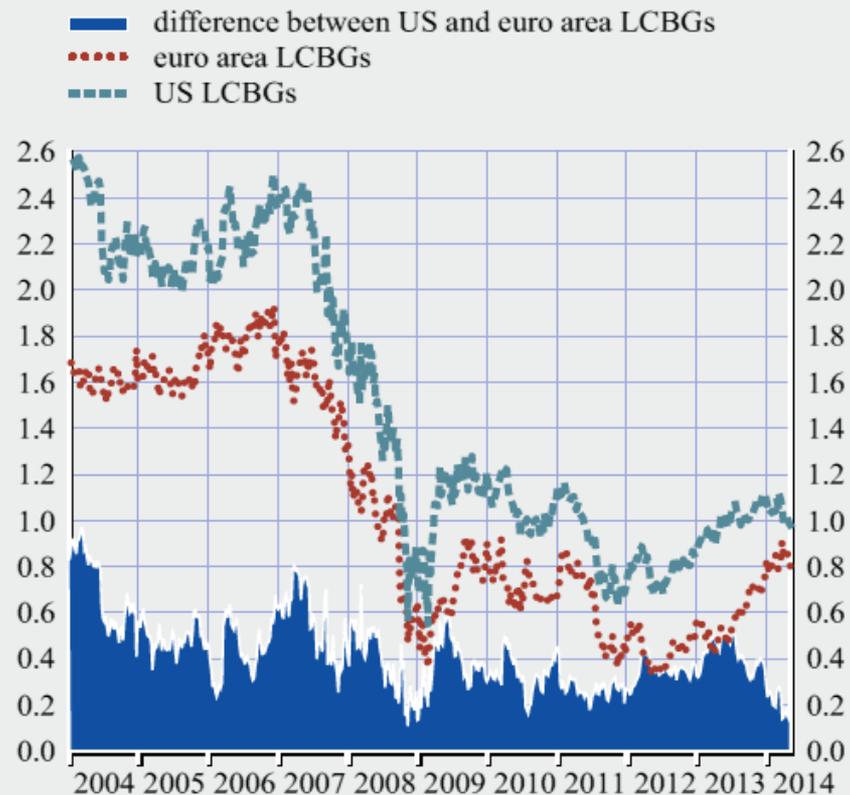


Source: Bloomberg.

Note: Based on median ROE and ROE forecasts for listed SBGs in vulnerable and other countries.

## Price-to-book ratios of large and complex banking groups. Euro Area and US

(Jan. 2004 – May 2014; ratio)



Sources: Bloomberg and ECB calculations.

Note: Median values for LCBGs in the United States and the euro area.

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## 2.- Regulatory risk vs. actual risk

**Theory**

**Some evidence**

## 3.- Effects on risk taking

Theory

Some evidence: banks' betas

## 4.- Effects on the cost of funding

Cost of equity

Cost of debt

**If risk weighted assets provide an adequate measurement of risk, increased risk taking implies more capital is required.**

That is, if the risk profile ( $RWA/A$ ) increases, ( $E/A$ ) also has to increase to satisfy the regulatory ratio ( $E/RWA$ )

where :

E: regulatory equity,

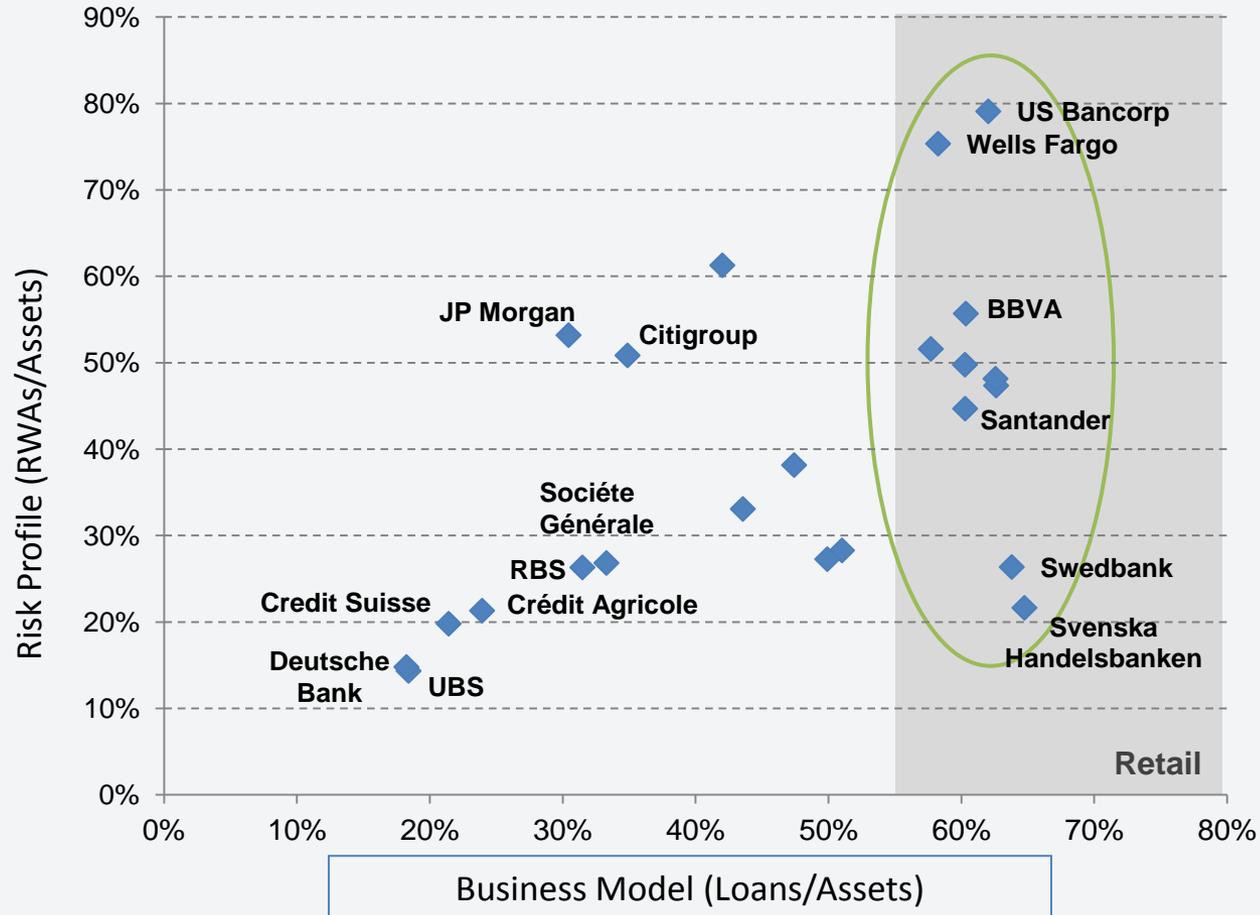
A: total assets and RWA: risk weighted assets

In other words:

if  $E/RWA$  increases and risk is perfectly measured, then either you raise E or you lower RWA (and if you do not lower RWA, at least you will increase E by the required amount of equity) → Higher capital ratios limit risk taking.

**But RWA is a poor proxy for the actual risk of an institution.**

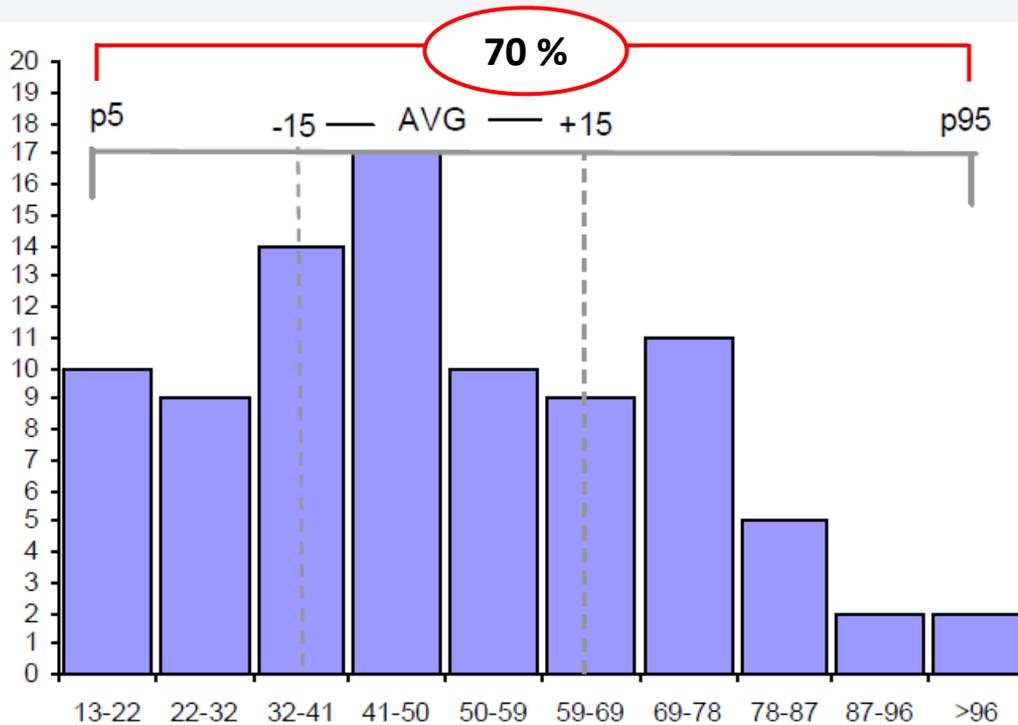
Business model vs. Risk profile 3T2011



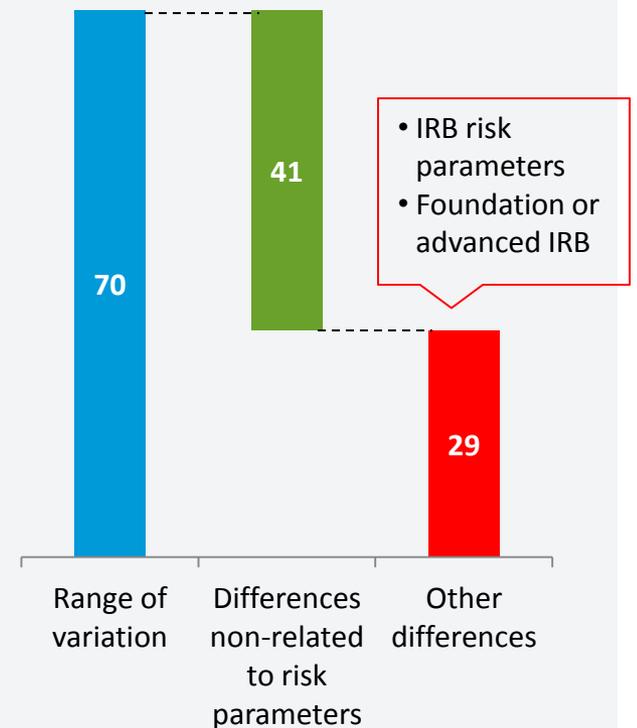
Source: Own calculations using Bloomberg data.

## Distribution of the Global Charge across EU banks

$$\text{Global charge (GC)} = \frac{\text{RWA} + 12.5 * \text{EL}}{\text{EAD}}$$



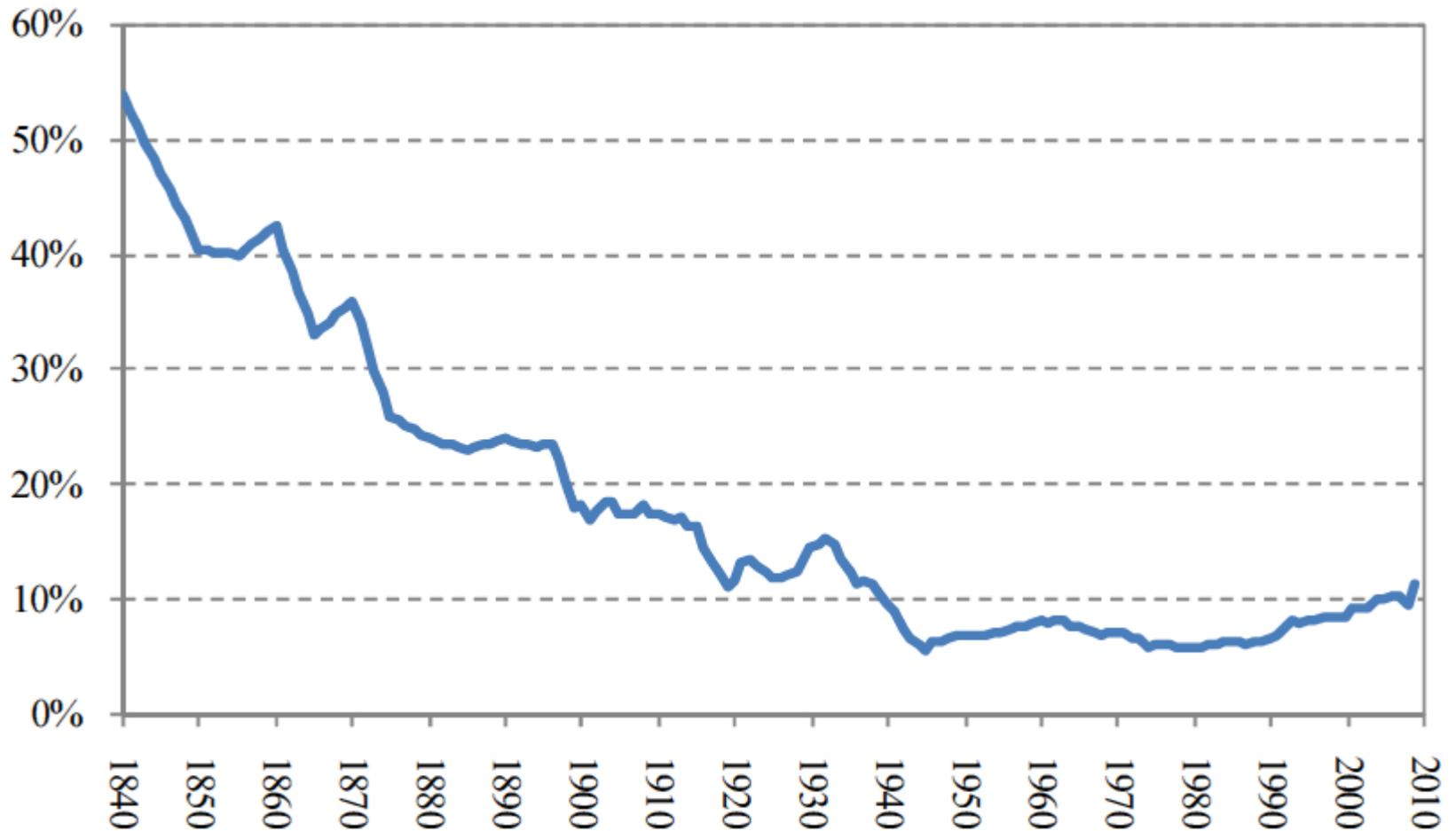
- Balance-sheet structure
- Different regulatory approaches



- IRB risk parameters
- Foundation or advanced IRB

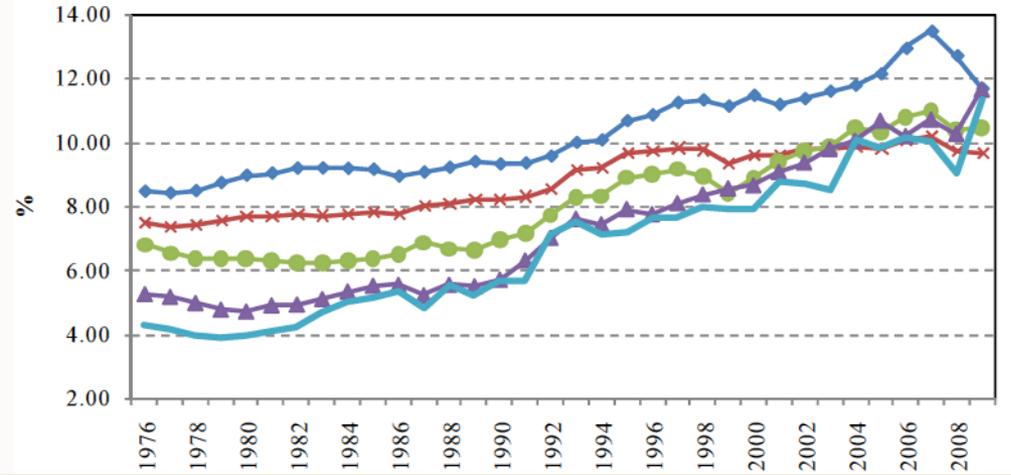
Source: European Banking Authority, 2013.

## Book equity to book assets for US Commercial Banks

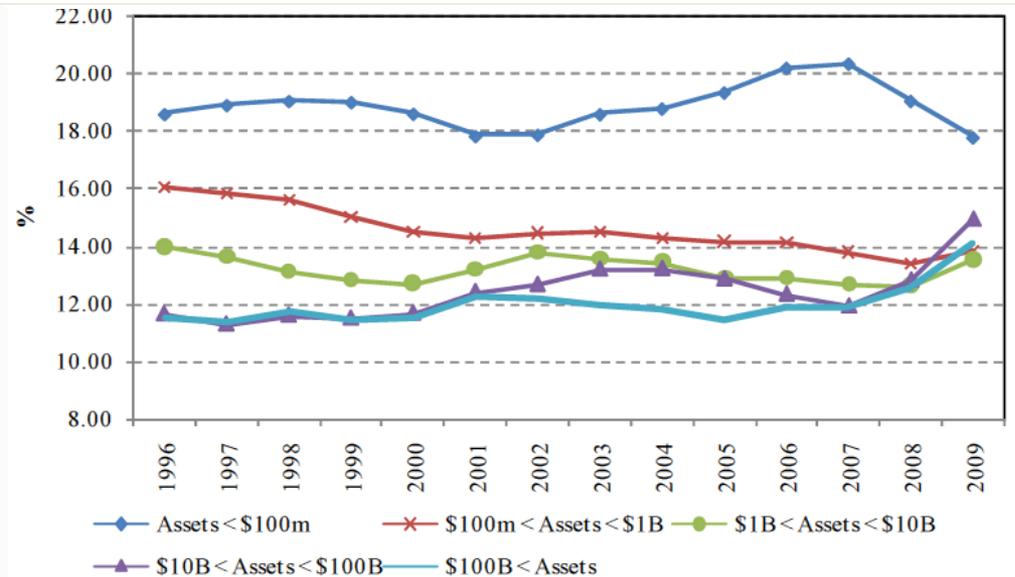


**US Bank capital ratios by bank size, 1976-2009**

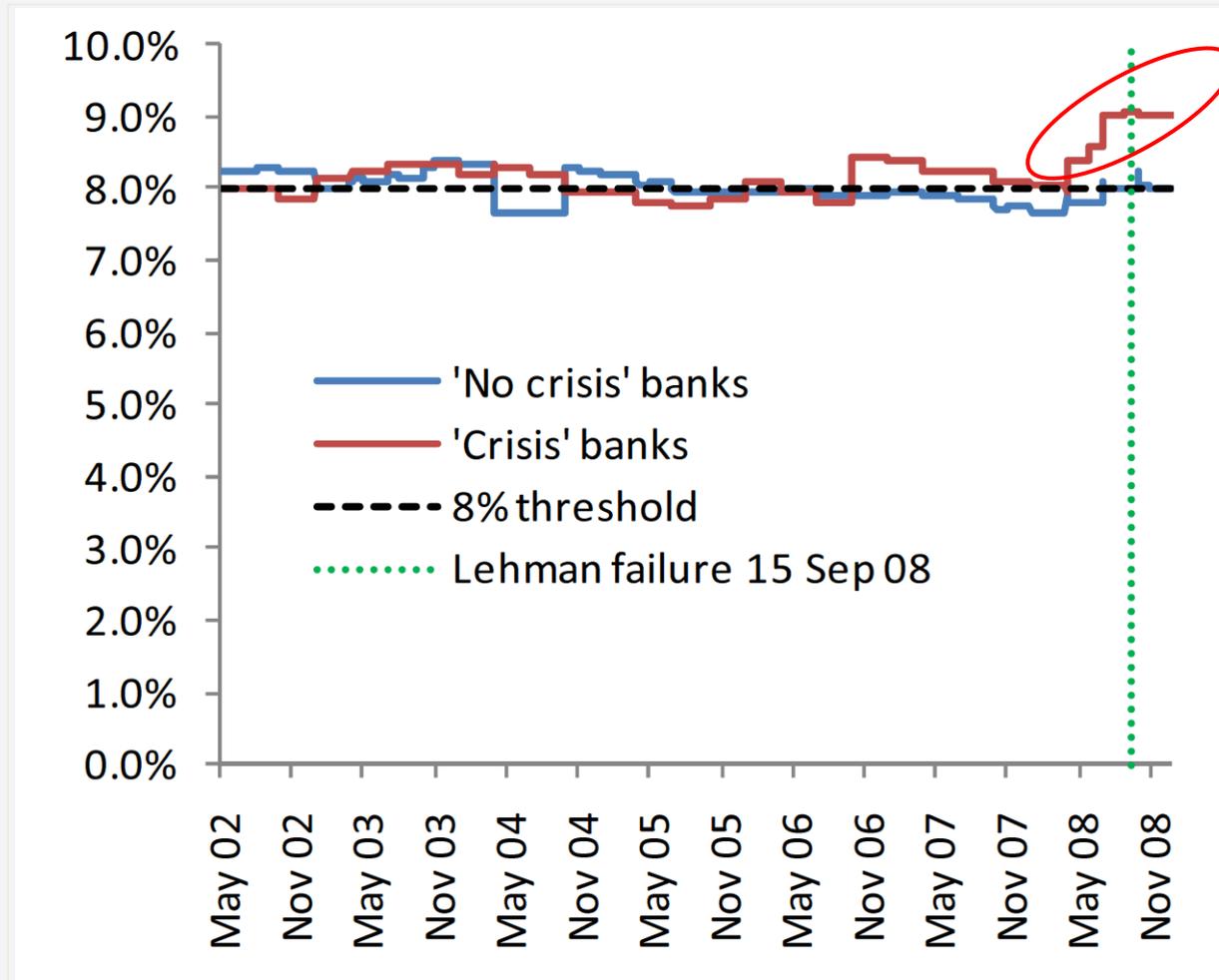
**Book equity to book assets**



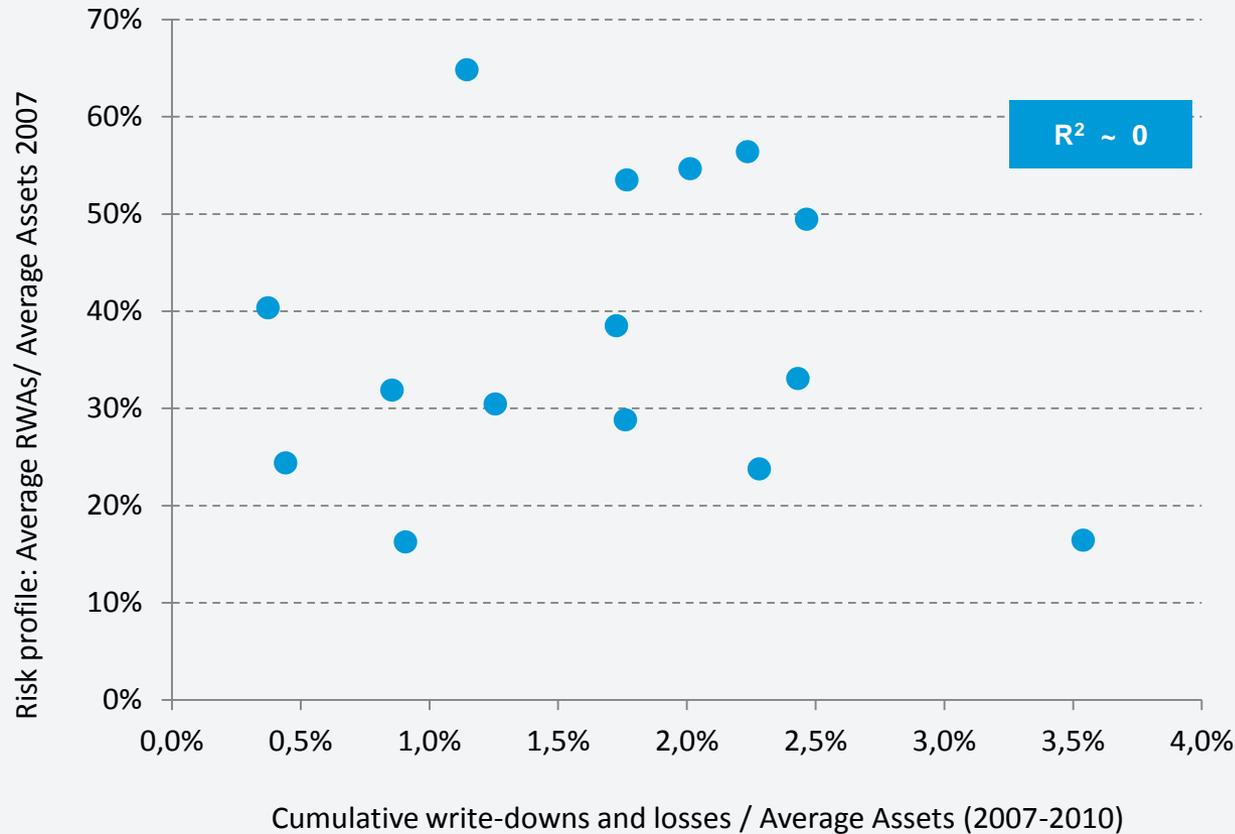
**Total risk-based capital ratios**



## Tier 1 capital ratios for "crisis" and "no crisis" banks



## Risk profile and cumulative write-downs for some European banks



15 banks in the sample: Royal Bank of Scotland, HSBC, Barclays, Lloyds Banking Group, UBS, Credit Suisse, Banco Santander, BBVA, Unicredit, Intesa Sanpaolo, Deutsche Bank, Commerzbank, BNP Paribas, Societe Generale y Crédit Agricole.  
Source: Bloomberg.

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**What theoretical arguments may explain that higher regulatory requirements lead to more actual risk taking instead of less:**

- a) **Limited liability** (Koehn and Santomero, 1980; Kim and Santomero, 1988)
- b) **The option value of insured deposits** (Flannery, 1989)
- c) **Anticipation of regulation** (Blum, 1999; Hellman et al. 2000)
- d) **Non-normal distribution** (Perotti et al. 2011)
- e) **Monitoring incentives** (Boot and Greenbaum, 1993)

- 
- 1) **On theoretical grounds we cannot therefore take for granted that higher capital requirements will imply less actual risk taking.**
  - 2) **On empirical grounds, work by Haldane (2012) and Das and Sy (2012) supports also increased risk-taking.**
  - 3) **Let's look at the evidence, again.**

## Methodology

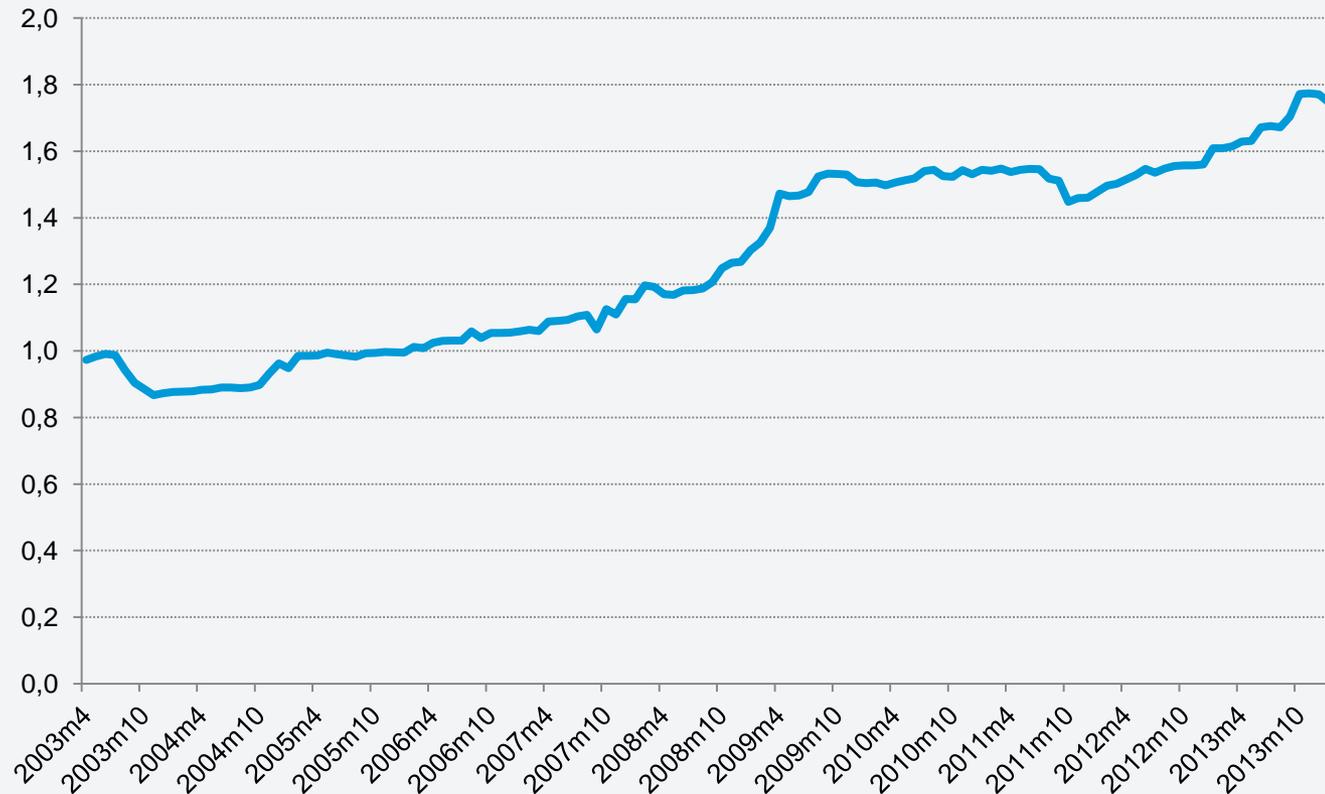
### Data:

- 28 european banks...
- ... from 9 countries
- Using monthly data from December 2002 to March 2014

### CAPM method:

- Consider the Euro Area equity market (Eurostoxx EA) and a European risk free rate (10 yr German *Bund*)
- Estimate bank  $i$  perceived risk using  $r_{it} = r_t^f + \beta_{it} \cdot (r_t^m - r_t^f)$
- ...and 60-months rolling regressions.

## Average beta\*



(\* ) Simple average excluding banks with poorly estimated betas and/or incomplete data on leverage. Final sample includes 12 banks: Kbc, BNP Paribas, Natixis, Commerzbank, Deutsche Bank, Monte dei Paschi, Banca Popolare di Milano , Mediobanca, Unicredit, BCP, BBVA and Santander.

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**Cost of equity**

**Cost of debt**

**Basel III assumes that increasing the capital ratios will not increase the cost of funding** (it if does, it will be only temporarily, in the short run).

Rationale (Modigliani-Miller): as  $(E/A)$  increases, (perceived) risk falls and so does the cost of funding (the expensive type of funding increases its share, but both debt and equity funding costs diminish).

**Theory: key assumptions for the Modigliani-Miller theorem to hold**

- a) **No taxes** (Stein, 2010)
- b) **No bankruptcy costs** (Stiglitz 1969, 1972)
- c) **Replication of financial structure by private investors** (Mink, 2011)
- d) **No asymmetric information** (Dewatripont and Tirole, 1993)

And, of course, investors have to believe that risk will indeed go down.

See also Dermine (2012) and Bolton and Samama (2012) for related theoretical arguments.

**From an empirical point of view, testing whether MM holds involves testing also the extent to which increasing the capital ratio diminishes perceived risk.**

**Some of the relevant papers:**

Bichsel and Blum (1999)

Hovakimian and Kane (2000)

King, (2009)

Kashyap et al. (2010)

Miles (2011)

Yang and Tsatsaronis,(2012)

Dermine (2012)

**What are the key methodological concerns:**

- **How do you measure leverage (accounting, market, and regulatory leverage)**
- **How do you measure perceived risk?**
- **How do you measure the cost of equity?**
- **How do you take into account the simultaneity between leverage and risk?**

## Methodology

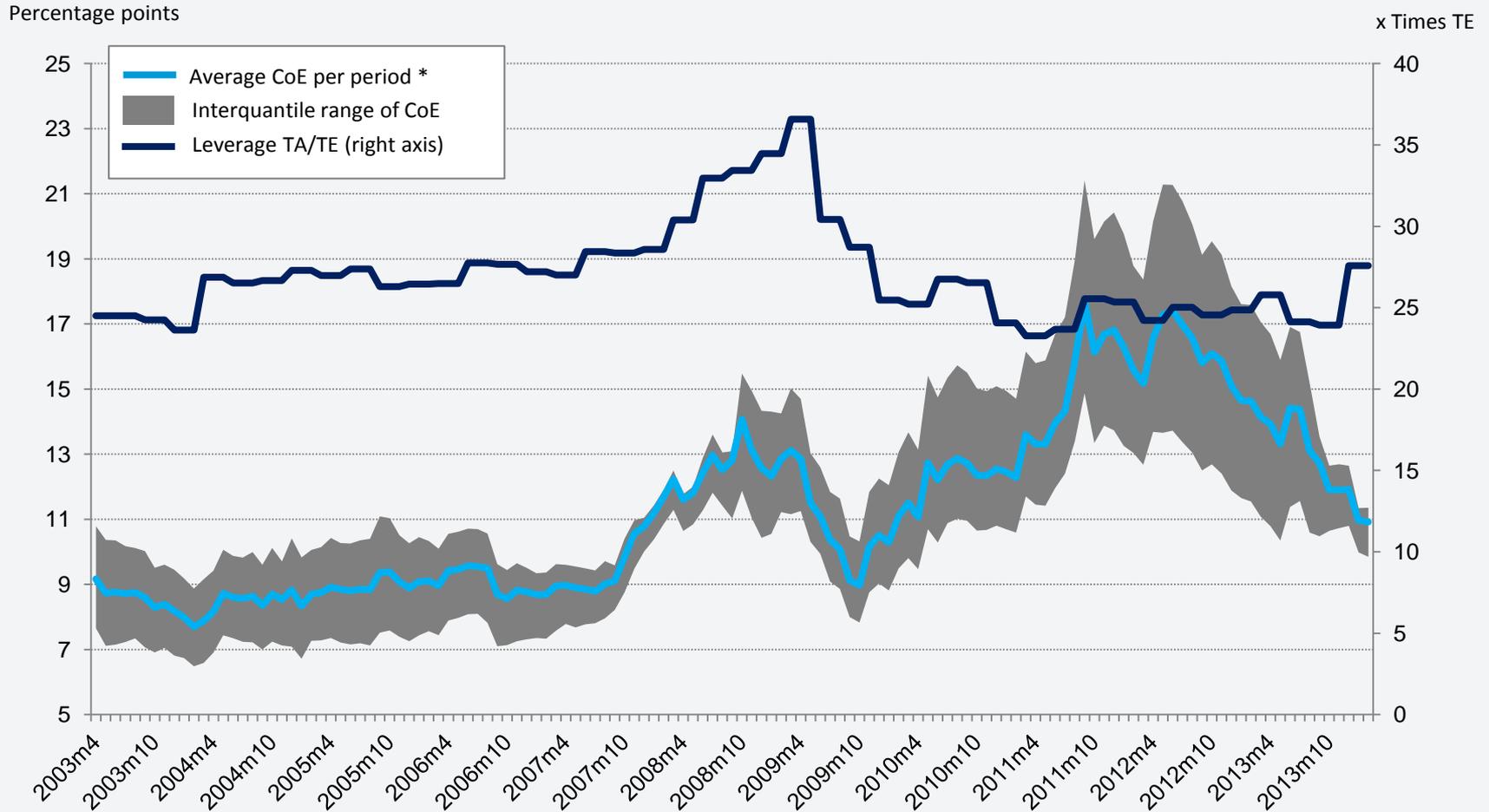
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### CAPM method:

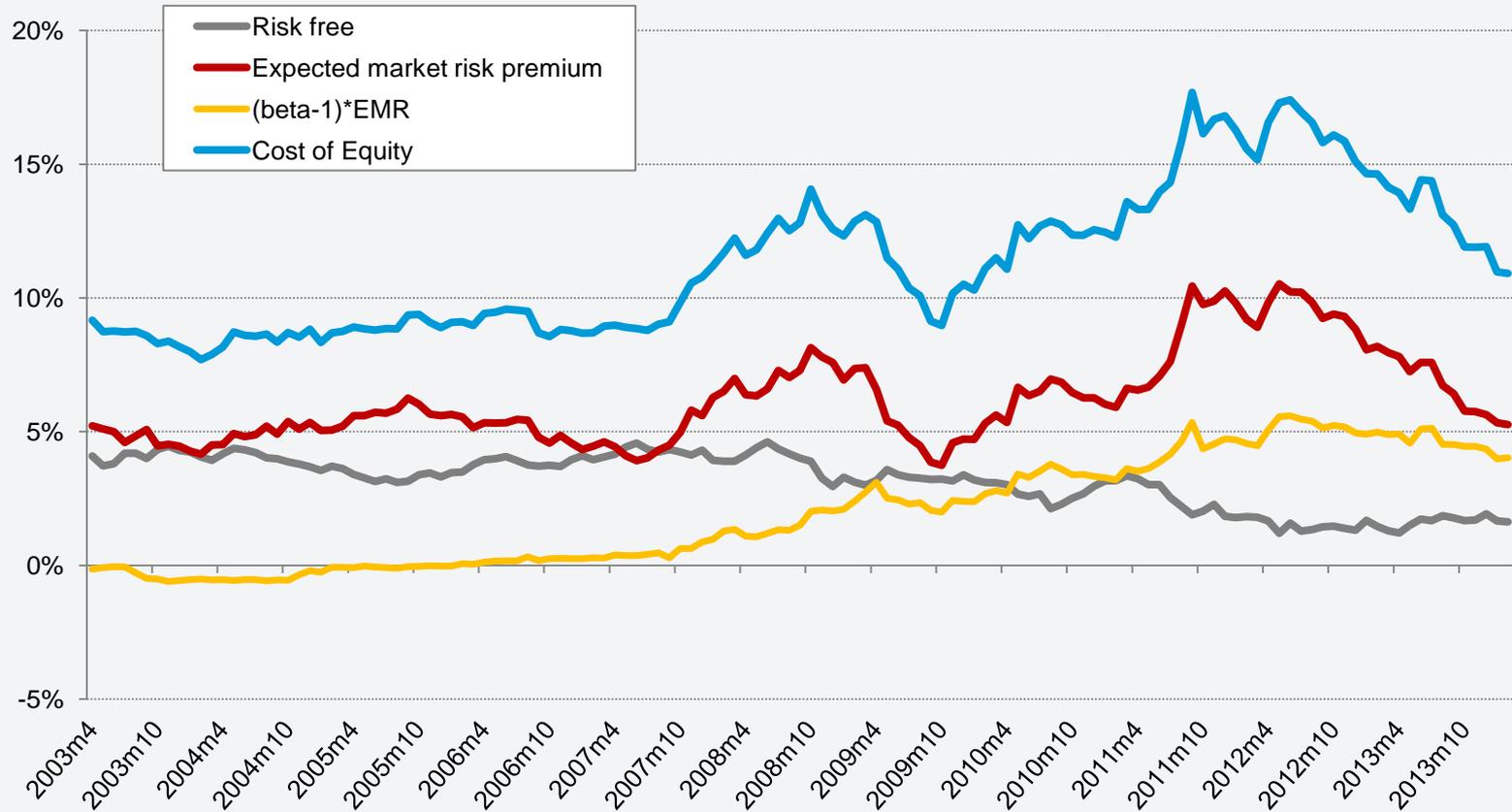
- Use the previously estimated betas  $\beta_{it}$
- Compute the expected market risk premium  $\mathbf{E}(MRP_t)$  using the inverse of the cyclically adjusted price-earnings ratio (CAPE) for Eurostoxx Euro Area listed companies
  - data prior to 2009 interpolated using observed relationship with CAPE for S&P 500 listed companies
- Bank  $i$  cost of equity is then given by  $e_{it} = r_t^f + \beta_{it} \cdot \mathbf{E}(MRP_t)$

## Higher cost of equity despite similar accounting leverage



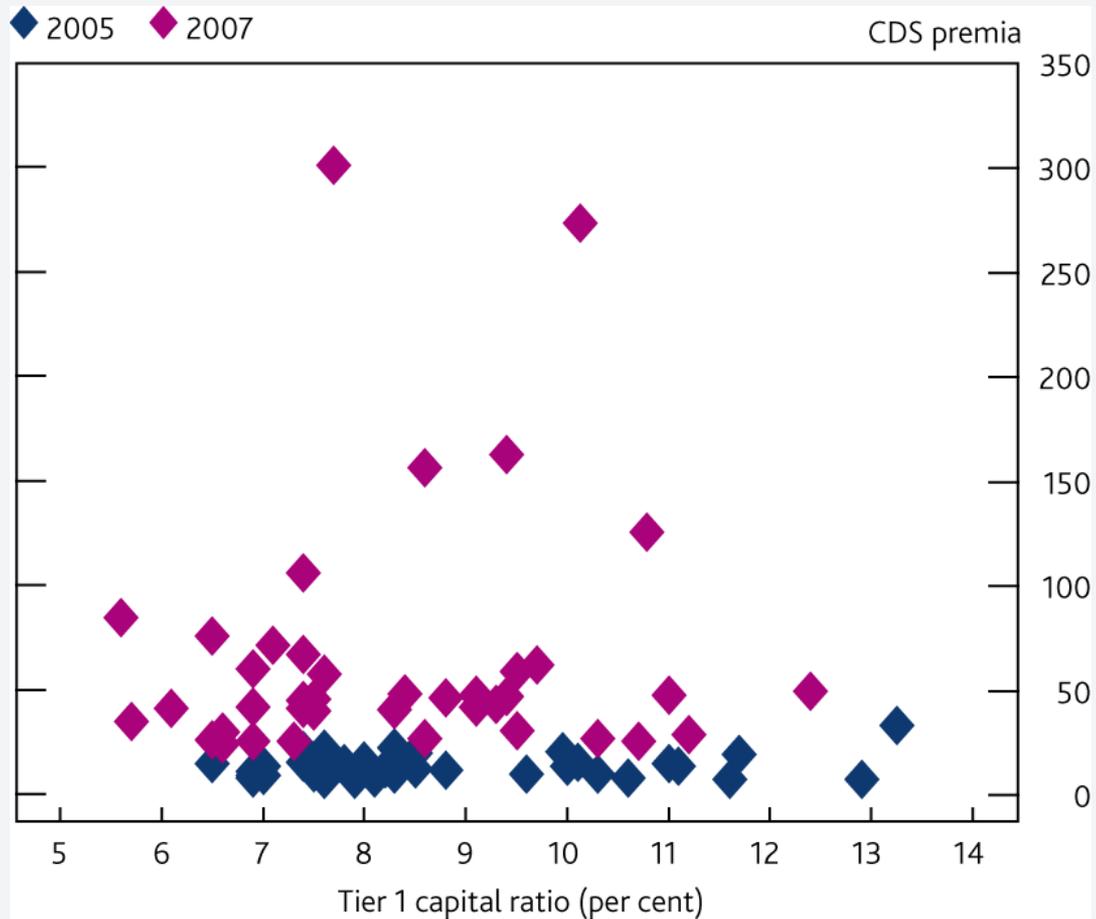
(\*) Simple average excluding banks with poorly estimated betas and/or incomplete data on leverage. Final sample includes 12 banks: Kbc, BNP Paribas, Natixis, Commerzbank, Deutsche Bank, Monte dei Paschi, Banca Popolare di Milano, Mediobanca, Unicredit, BCP, BBVA and Santander. TA: Tangible Assets, TE: Tangible Equity.

## Average cost of equity\*



(\*) Simple average excluding banks with poorly estimated betas and/or incomplete data on leverage. Final sample includes 12 banks: Kbc, BNP Paribas, Natixis, Commerzbank, Deutsche Bank, Monte dei Paschi, Banca Popolare di Milano, Mediobanca, Unicredit, BCP, BBVA and Santander.

Five-year CDS premia versus Tier 1 capital ratio(a)



Data: Bankscope published by Bureau van Dijk Electronic Publishing and UBS Delta (Markit Partners).  
(a) Sample includes 40 of the 100 largest banks in the G10 by total assets, due to data availability.

Source: Bank of England, Financial Stability Report June 2009.

## Methodology

### Has the change in bail-out expectations an impact on the cost of debt?

**Bond spread differential** (as in Acharya, Anginer & Warburton 2013).

- Analysis of the yield spread between bank bonds and public debt of similar maturity.
- Controls: issuer and issuance characteristics, macro outlook.
- Difference-in-difference estimation: we estimate the average change in the spread of a given bond before and after the change in bail-out expectations.
- Bail-out expectations change in the EU with the introduction of the statutory bail-in requirement in August 2013. Alternative date: Commission proposal for a Bank Recovery and Resolution Directive (June 2012).

### Sample:

- 633 outstanding issuances of bank bonds (senior and subordinated) issued by 19 different institutions.
- Bond selection: EU issued, without equity or derivative features and with fixed interest rates.
- Monthly data from dec'07 to mar'14 (69 months).
- Institutions: Erste Group, Commerzbank, Banco Popolare, Unicredit, Banco Comercial Portugues, Banco Espirito Santo, BNP, Banco Santander, BBVA, CaixaBank, Credit Agricole, Deutsche Bank, Intesa Sanpaolo, KBC, Mediobanca, Natixis, Pohjola Bank, Société Générale, Ubi Banca.
- Countries: Austria, Germany, France, Finland, Belgium, Italy, Portugal and Spain.

### Specification

#### Average effect across banks:

$$Spread_{i,b,t} = \alpha + \delta \cdot \underline{\text{Change Expectations}} + \beta_1 \cdot \text{Bond Controls}_{i,b,t} + \beta_2 \cdot \text{Firm Controls}_{i,b,t} + \beta_2 \cdot \text{Macro Controls}_{i,t} + \text{Bond FE} + \varepsilon_{i,b,t}$$

#### Bank specific effect, as a function of institution's characteristics:

$$Spread_{i,b,t} = \alpha + \delta_i \cdot \text{Change Expectations} + \beta_1 \cdot \text{Bond Controls}_{i,b,t} + \beta_2 \cdot \text{Firm Controls}_{i,b,t} + \beta_2 \cdot \text{Macro Controls}_{i,t} + \text{Bond FE} + \varepsilon_{i,b,t}$$

where  $\delta_i = (\delta_0 + \delta_1 \cdot \text{Firm Controls}_{i,b,t} + \delta_2 \cdot \underline{\text{Bond Controls}_{i,b,t}})$

#### Bond Controls:

- Years to maturity
- Subordinated debt

#### Firm Controls:

- Systemic institution (largest banks in terms of assets of assets/GDP)
- Perceived risk (beta)
- Inverse of accounting leverage (Tangible Equity/Tangible Assets)
- RoA
- Price to Book

#### Macro Controls:

- Market risk premium
- Term risk premium (spread 10y – 3m)
- Default risk premium (spread BBB-AA)
- Country risk premium (10y sovereign spread wrt Germany)

Dependent variable: spread wrt risk-free of similar maturity							
Date of change in expectations: E.U. statutory bail-in requirement (Ago'13)							
Leverage variable:	TE/TA	TE/TA	(Tier1 + Tier2 / A)	(Tier1 + Tier2 / A)	None	None	None
beta	0.156***	0.063	0.152***	0.047	0.143***	0.132***	
YTM	0.031**	0.045***	0.032**	0.043***	0.034**	0.053***	
Leverage	-0.028*	-0.032**	-0.016***	-0.055***			
RoA	-0.081***	-0.086***	-0.079***	-0.090***	-0.080***	-0.088***	
PtB	-1.245***	-1.373***	-1.273***	-1.399***	-1.243***	-1.392***	
mkt_premium	0.111***	0.110***	0.112***	0.111***	0.112***	0.112***	
term_premium	0.414***	0.424***	0.423***	0.436***	0.415***	0.429***	
def_premium	1.078***	1.023***	1.089***	1.022***	1.094***	1.05***	
countryPremium	0.908***	0.907***	0.906***	0.908***	0.907***	0.902***	
D_2008	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	
D_2009	0.149**	0.132**	0.147**	0.116**	0.160***	0.137**	
D_2010	0.027	0.014	0.017	-0.003	0.031	0.011	
D_2011	0.303***	0.305***	0.295***	0.306***	0.303***	0.3***	
D_2012	-0.126***	-0.118***	-0.137***	-0.130***	-0.123***	-0.119***	
D_2013	-0.285***	-0.220***	-0.272***	-0.235***	-0.255***	-0.224***	
D_2014	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	
_cons	-1.166***	-0.996***	-1.204***	-0.795***	-1.315***	-1.308***	
<b>Change in expectations about bail-outs</b>							
D_changeExp	<b>0.125***</b>	-1.119***	<b>0.130***</b>	-1.281***	<b>0.122***</b>	-0.721***	
systemic x D_changeExp		<b>0.134***</b>		<b>0.164***</b>		0.025	
beta x D_changeExp		<b>0.355***</b>		<b>0.402***</b>		<b>0.252***</b>	
YTM x D_changeExp		<b>0.013***</b>		<b>0.014***</b>		<b>0.012***</b>	
subordinated debt x D_changeExp		<b>-0.437***</b>		<b>-0.439***</b>		<b>-0.432***</b>	
Leverage x D_changeExp		<b>0.042***</b>		<b>0.049***</b>			
RoA x D_changeExp		0.045		<b>0.060*</b>		0.028	
PtB x D_changeExp		<b>0.469***</b>		<b>0.464***</b>		<b>0.507***</b>	
<b>Statistics</b>							
Issue Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	
Num. Observations	17,144	17,144	17,144	17,144	17,144	17,144	
Num. of groups	633	633	633	633	633	633	
R2 within	0.711	0.713	0.711	0.714	0.711	0.713	
R2 between	0.602	0.614	0.599	0.612	0.6	0.621	
R2 overall	0.633	0.633	0.631	0.633	0.630	0.633	
RMSE	0.595	0.592	0.594	0.592	0.595	0.593	

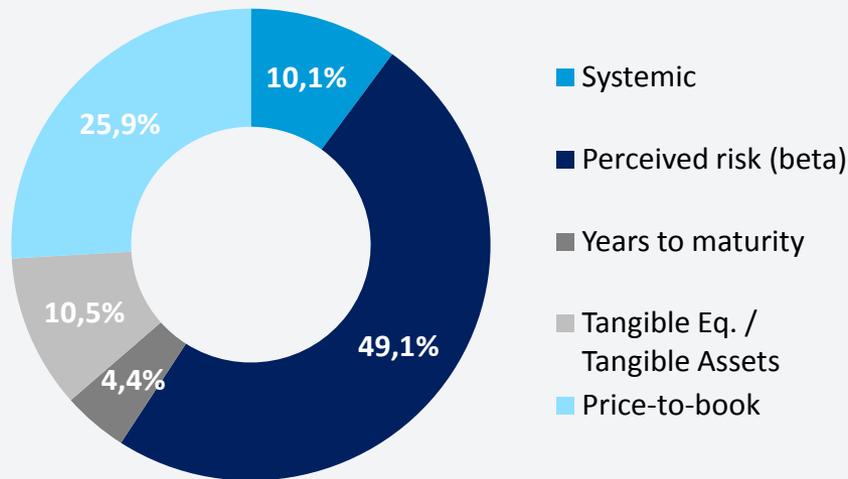
### Descriptive statistics. Date of change in bail-out expectations: E.U. statutory bail-in requirement (Aug'13)

	Systemic banks		Non-systemic banks		Total	
	Mean	St. Dev	Mean	St. Dev	Mean	St. Dev
<b>Pre expectation change</b>						
<b>Spread</b>	<b>2.18</b>	<b>1.28</b>	<b>2.76</b>	<b>1.56</b>	<b>2.59</b>	<b>1.50</b>
beta	1.55	0.18	1.53	0.39	1.53	0.34
YTM	5.95	4.69	5.22	3.62	5.44	3.98
Moody's initial rating	6.35	2.49	6.01	1.75	6.11	2.01
subordinated debt	0.00	0.00	0.03	0.18	0.02	0.15
Leverage (TE/TA)	2.69	1.22	5.37	1.66	4.58	1.97
RoA	0.09	0.26	0.00	0.57	0.02	0.50
PtB	0.59	0.20	0.55	0.24	0.56	0.23
<b>Post expectation change</b>						
<b>Spread</b>	<b>1.33</b>	<b>0.54</b>	<b>1.82</b>	<b>0.87</b>	<b>1.67</b>	<b>0.81</b>
beta	1.84	0.21	1.84	0.30	1.84	0.27
YTM	4.53	3.67	3.99	4.38	4.16	4.17
Moody's initial rating	7.15	2.34	7.29	2.71	7.24	2.59
subordinated debt	0.00	0.00	0.02	0.13	0.01	0.11
Leverage (TE/TA)	3.34	1.17	5.93	1.44	5.11	1.82
RoA	0.13	0.16	-0.15	0.51	-0.06	0.45
PtB	0.74	0.17	0.71	0.28	0.72	0.25
<b>Average Effect of bail-in introduction</b>						
Senior debt	0.22	0.11	0.17	0.15	0.19	0.14
Subordinated debt	n.a.	n.a.	-0.26	0.14	-0.26	0.14

### Effect of bail-in introduction on the senior debt of systemic banks

#### Marginal effects at the sample means

In % of total contributions



#### Total effect at the sample means

In percentage points

